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and divide and unite, as it is known that the Benin does with the Warree, and, as reported by the natives, with the New Calabar. The communication between the Bonny and the Andony has also been established.

The base of the Camaroon mountains occupies a space of twenty miles in diameter, the highest peak being thirteen thousand feet above the sea, covered with trees of luxuriant growth nearly to the summit; one bare brown ridge alone appears like lava. More distant is the Rumley Range, formed of rugged masses, and seen upwards of sixty miles. Qua Mountain, sixty-four miles N.W. of Camaroon, is also a stupendous elevation; it was seen at a distance of nearly eighty miles.

From Rio del Rey, the Barracouta returned to Fernando Po, and thence proceeded to Sierra Leone, where she rejoined the Leven. An officer and party, that had been previously despatched in the African steam-vessel to survey the river Gambia, which they ascended as far as Macarthy's Island, one hundred and eighty miles from its mouth, rejoined the squadron at Sierra Leone, and they all sailed in company for England, where, after touching at Porto Praya, they arrived, after an absence of five years, during which the expedition had traced about thirty thousand miles of coast-line.

II.—*Account of the Mahavillaganga*; abridged from the Journal of an Excursion to explore it, undertaken, under Instructions from Government, by R. Brooke, Esq., Master Attendant at Trincomalie. Colombo. 1833.

THE Mahavillaganga, well known as the largest river in the Island of Ceylon, takes its rise from the mountains in the Kandyan country, and after encircling the city of Kandy, flows in an easterly direction almost as far as Bintenne, when it bends suddenly to the northward, and after running some distance, divides into two streams, one falling into the great bay of Trincomalie, the other, which is called the Virgel, into the sea, twenty-five miles southward of Trincomalie.

In taking a cursory view of the Mahavillaganga, and the country through which it flows, it appears that the river from Kandy is a mountain torrent till within seven or eight miles above Bintenne, whence it flows in a free course to Calinga, with the exception of a slight interruption twenty-eight miles below Bintenne. The width of the river from the termination of the torrent part to Calinga is from a hundred and fifty to two hundred and fifty yards, and the course is shallow during the dry season, (from one to two feet deep,) but rising twenty-five and thirty feet at the period of the freshes.



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On Stone by C. Bradbury

MAHAVILLAGANGA RIVER at PERADENIA, CEYLON.

Published for the Journal of the Royal Geographical Society by John Murray Altemaria, 5, 1853

At Calinga the bed of the river is rocky for about twelve miles, with slight falls from one to three feet, which, with the rocky bed, are visible only when the river is low, as at half rise the rocks are not perceptible, excepting at the northern or lower end of this rocky part properly called Calinga, where, for the distance of a mile, the river is divided into several channels impeded by large stones, which offer an impediment to navigation, in its present state, at any time.

From Calinga to Trincomalie the river is perfectly free from rocks; the distance by water is about eighty miles, and the country on either side but little cultivated, though there are extensive traces of former cultivation. It is, however, but seldom navigated, and only by the canoes of wood-cutters at short periods of the year. This is owing to the river having been diverted from its natural course, and directed into the Virgel, which was formerly but an insignificant stream, but has now become the outlet of the river, excepting for a few days in the year.

At the junction of the Virgel, the Mahavillaganga takes a very acute elbow turn, in the bight of which the Virgel branches off. Near the mouth of this stream is a large Gentoo temple, with extensive paddy plains attached to it; the country around for many miles is a flat, and has been extensively cultivated. It was thus necessary, at one time, to obtain a greater supply of water than the ordinary stream of the Virgel furnished, and the priests of the temple, taking advantage of the sudden turn of the Mahavillaganga at the junction of the Virgel, widened and deepened the commencement of this stream, thus easily directing the main body of water down it; since which it has increased and divided into several streams, overflowing at the least rise of the river some extensive plains, which in consequence are now rendered incapable of cultivation. A greater evil is thus at present experienced by the overflow of the Virgel than that which formerly existed from a want of water.

In consequence of the river being thus turned into the Virgel, its proper bed from the junction to Goorookelganga (a distance of ten miles below) is perfectly dry nearly the whole year, and would continue so to the mouth, but for a narrow cross stream called Adambanar, which, branching from the river above the junction, falls in again at Goorookelganga. This has erroneously been considered a part of the main river, and the dry bed alluded to, supposed to be merely a canal choked up by sand; a mistake originating in a very careless inspection, as the dry bed of the river is from a hundred to two hundred yards wide—whereas the Adambanar, or cross stream, is only from twenty to thirty yards wide, and in one place not more than ten yards. Beyond doubt, therefore, this supposed canal is the river, dry at certain periods in consequence

of the upper stream being diverted into the Virgel, and only navigable a short period of the year, when the freshes set down from the upper country. Only during the very high rise of the river does water flow round the elbow sufficient to float a small raft of timber, at which period this acute turn becomes very dangerous, great skill being requisite to direct the rafts, as, should they take a direction towards the Virgel, (which, from the very strong eddies that then exist, they are apt to do,) the people swim for the shore, abandoning the timber, which is lost by flowing out to sea at the mouth of the Virgel. In this manner much timber is annually lost, it being impossible to navigate rafts down the Virgel, and it was only a year since that, out of six unfortunate men who were taken down the Virgel with their rafts, five lost their lives.

Very great advantages would, however, be derived from restoring the Mahavillaganga to its old channel. The only export from Trincomalie is timber, chiefly consisting of halmaniel, ebony, and satinwood, each well known for their valuable qualities, but at present forming but a small return for the great quantity of grain and cloth imported. Satin and ebony grow in all the jungle about Trincomalie, especially upon the sea-coast; but halmaniel is chiefly procured in the interior on the banks of the Mahavillaganga, cut during the dry season, and remaining in the forest for many months before it is rafted down. Should the woodcutters (who are generally inhabitants of Trincomalie) have returned to their homes, and neglected to take advantage of the full rise, they lose the opportunity of getting the rafts down. Circumstances of this nature often occur, when the timber must remain for another year, to the loss and detriment of the timber merchant, for in the mean time it becomes deteriorated from rot, and is liable to be stolen, or washed away by a sudden overflow of the banks. An instance of this occurred in January last, when three hundred and seventy-five logs of timber were lost in the Virgel. Timber has also been detained in the jungle by neglect till it became so decayed as to fetch only one-sixth of its original value. If, therefore, the river were opened, timber would be no sooner cut than floated down, and the merchant be enabled to exercise an efficient superintendence over his property. At present, being obliged to advance wages to the wood-cutters, he is completely at their mercy, and instances are not unfrequent of timber which has been felled for one person being sold to another.

As another proof of the necessity for removing these impediments, (setting aside advantages that must eventually accrue to Government,) it may be remarked, that timber in the forests is cut into logs of about eighteen feet long and twelve inches square, although the trees are capable of furnishing logs of a much larger

size. Timber thus reduced in size must also be so in value. It is particularly worthy of notice, that the only timber now brought down by the Mahavillaganga is such as will float, whilst ebony, satin, cattamanack, and ironwood, abundance of which are to be found growing on the banks and in the Tambankadewa and Vedah country, being too heavy to float, are altogether neglected. If the river were opened, boats, canoes, and rafts would be able to convey these woods to a market, and there is not the slightest doubt but that the advantages to be derived from such an undertaking would soon repay the expenses.

There are several kinds of timber too cumbersome to be brought to Trincomalie in consequence of the impediments at Kooranjemony, especially Wallaport and Peon. The former is used in the construction of large canoes, the trees girting twenty-eight and thirty-two feet; and Peon is well known as being calculated for ships' masts. To prove how essential these spars are, it may be mentioned that when the ship *Circassian* of five hundred, and brig *Grecian* of two hundred tons, came into Trincomalie harbour dismasted, the first paid to the naval yard 110*l.* for a crooked Peon spar, (afterwards turned out of her at Calcutta,) whilst the captain of the *Grecian* paid about 50*l.* for a Peon foremast, and left the port in great distress for want of a mainmast.

By removing the impediments at Kooranjemony, the river would become easily navigable to Calinga, (eighty-three miles from the sea,) thus opening the Tambankadewa and Vedah country, and instead of the present limited trade being carried on at a few places right and left of the river, a more extensive and prosperous one would rise in its place. Grain grown in the former district, together with bulky merchandise, would obtain a cheap carriage and an access to the Trincomalie market.

At present, the grain produced there is collected at a place called Tambale within the district, sold to the highest bidder at the Trincomalie Cutcherry for about threepence per parrah, deliverable to the purchaser at Tambale, sixty miles from Trincomalie. The circumstance of this grain selling for threepence at Tambale, and eighteenpence in the Trincomalie bazaar, speaks for itself. If a free communication were once opened, government grain would fetch 200 per cent. above its present price; the inhabitants in the interior would benefit, first, by dispensing with cattle conveyance; secondly, by finding a ready sale for their produce; and thirdly, by obtaining articles from the maritime parts, namely, salt, cocoa-nuts, salt-fish, &c. much cheaper than at present. Even now the inhabitants up the river take every advantage they can of conveying their merchandise by water whenever the depth is sufficient.

Having adverted to the advantages that must arise to the inha-

bitants in the Tambankadewa district, and the sources of additional revenue to government, it is necessary to remark that the impediments at Calinga are not of so difficult a nature as to prevent these advantages from being extended so high up as the populous district of Velasse and the Kandyan country, to which the articles of consumption required from the maritime provinces at present are conveyed by cattle, principally from Hambantotte and Batticaloa. Of course this method of carriage must be infinitely dearer than a water conveyance; and when the extensive revenue this colony derives from salt alone is taken into consideration, it must be obvious that a water-communication would naturally extend the consumption of this article. Should this river ever be thrown open, produce and merchandise from the sea-ports of Ceylon would find their way up, give encouragement to the coasting trade, and undoubtedly benefit the population of the interior, giving them the advantage of bartering their produce for tobacco, cloths, cocoa-nuts, salt-fish, &c. &c.; in fact, it is impossible to say what advantages may eventually arise by opening such a line of communication.

The river forms the western boundary of the Vedah district; the country is free from swamps and covered with low jungle, and is capable of producing grain, namely, Indian corn, natcharine, &c., which the people no doubt would cultivate in abundance had they a water communication enabling them to send it to market.

The Vedahs are erroneously supposed to be wild and uncivilized, but are in truth mild and inoffensive. Though averse to cultivation, they willingly undertake the felling and removing of timber.

The country through which the Mahavillaganga flows was beyond doubt once extensively cultivated; but, at present, there are only a few small villages scattered around on either side of its banks, the paddy-fields annexed to which are chiefly irrigated by the river; the inhabitants, taking advantage of its rise, direct the water to tanks formed near their grounds. Of late years, however, many spots have remained uncultivated in consequence of the river overflowing its banks and inundating the plains. This evil is becoming worse, particularly in plains irrigated by the Virgel, a circumstance which induced the late Mr. Lusignan to visit Koranjemony, in order to ascertain whether the evil could be remedied. This overflow is occasioned by the check the river meets with at this point, at the period when large bodies of water rush down during the freshes, and also from the Virgel being confined and not permitting the water to escape freely. Were these obstacles (so ruinous to the inhabitants) removed, the river would possess a double outlet without any impediment, and would in time force away the masses of sand that for many years have been

collecting at the turns and adding to the obstacles of the river. It is also to be observed, that at the mouth of the Virgel there is a bar of sand thrown up by the sea, only admitting a small boat to pass over it, while the mouth of the Mahavillaganga is very deep, and a quarter of a mile from it, within the great bay of Trincomalie, there are no soundings.

Besides the advantages that must evidently accrue to government by restoring the Mahavillaganga to its former course, it must also be borne in mind that the river flows through a country which was once the granary of the island, and any common observer visiting the Tambankadewa district must be surprised at the vast manual labour spent in the construction of the extensive tanks and canals, now totally neglected, and gone to ruin; so that, instead of the country deriving benefit from them, they have become pestilential morasses. Even now, however, numerous artificial and natural canals intersecting this country are not in so dilapidated a state but that they might easily be restored.

To turn the river into its proper course, it would be advisable to take advantage of a cross stream about five hundred and fifty yards long, cutting off the elbow of the river at Kooranjemony; by making this branch wider and deeper, it would naturally receive and secure the water, which, running down from above in a direct line, would flow into the river below, when it would soon force its way through the sand and prevent the dry bed (ten miles in extent) from forming again.

To check the river, immediately below the upper end of this cross stream, and enable the water to run with greater force in the new line, large trees that are growing about in abundance should be felled and laid across; these, with sand that would collect, would form a barrier sufficient to force the water to flow in the new direction when the river is low, it not being necessary to block up the Virgel entirely. The enterprise is not only feasible, but must prove successful, nor would the expense be so great as might naturally be supposed.

A bridge has been recently thrown over the Mahavillaganga, at Peradenia, consisting of a single arch (principally of satin-wood) of two hundred and five feet span.

The roadway is twenty-feet wide, and its height above the river at low-water mark about sixty-seven feet. The arch is composed of four treble ribs transversely distant from each other five feet from centre to centre.

The sum of the depths of these ribs is four feet, which, with

two intervals of two feet each, makes the whole depth of the arch eight feet.

The beams of which the arch is built are, with the exception of those next to the abutments, from sixteen to seventeen feet in length and twelve inches thick. They abut against each other with an unbroken section, and are secured at the joints by the notched pieces which support the road-way: the latter being held in their position by means of cross-ties both below and above the arch and immediately under the roadway. These cross-ties, with the aid of diagonal braces, which are also locked into them, serve to give stability and firmness to the whole structure.

According to the original design, no material but timber has been admitted into the construction of the arch. The arch was commenced in the middle of July, 1832. The centering was struck on the first of October, and the roadway was completed before the first of January last.

This bridge was designed and set up under the superintendence of Lieut.-Colonel Fraser, deputy quartermaster-general of the forces in Ceylon. Wooden bridges, generally, are condemned as being composed of a very perishable material, but on the principle on which this is constructed, the different parts of the arch may be replaced as they decay. The American wedge bridge is also said to be exceedingly flexible: but this has been completely obviated in the bridge at Peradenia.

Reference having been made above to the remains of ancient reservoirs and canals, found in the interior of Ceylon, the following particulars regarding them are further abridged from the Ceylon Almanack for 1833.

Ellaharah is distant about nine miles from Nalanda, and is a large village, containing about fifty families. The Ambanganga, about two miles from the village, has been checked, and directed inland, for the purpose of feeding several reservoirs or tanks. This conductor, or canal, passes through the village, and the water in it runs strong. The stream is six to fifteen feet wide, and two to three deep, during the time the Ambanganga is at its lowest state; but when the river rises, it is much wider and deeper, and formerly was still more so.

The end of this canal, from about four or five miles from its commencement, is twenty-five to thirty feet below the banks, and the earth which has been taken from the canal is conspicuous in large mounds close to it. It is the superstitious opinion of the inhabitants in the neighbourhood, that it was cut by people of

forty feet stature, at the time the Minnery, Kandelly, and other tanks were formed, and that it was so deep, an elephant could not ford it:—in fact, it does appear to have been five to fifteen feet deep, and forty to one hundred feet wide. The jungle has grown in the bed, but not very thick, and might easily be cleared to enable a person to inspect it. It runs into Kondrawawe tank, crossing in its way six rivers, which formerly were dammed across, and their streams directed into the canal. Water at present only runs in this canal from the Ambanganga, till it crosses the Kongatoo Oya (three-quarters of a mile from Ellaharah); here the dam that was formed across this river having broke, the water of the canal returns to the Ambanganga, and runs strong down in that direction.

About three hundred yards from the Ambanganga, a basin has been cut three to four hundred yards in circumference, said to have been excavated when the canal was made; and it no doubt was originally a harbour for boats passing up and down. The basin is filled with slimy mud, and would require little trouble to clear.

Kondrawawe tank is about fifteen miles from Ellaharah, half-way between that place and Minnery tank. It has a mound of earth on one side, but no sluices, and is about two miles in circumference. The canal beforementioned runs from Ellaharah into this tank, from which two others issue—the first to Minnery to fill the tanks in that direction; the second to Guretille tank, and others in that line for the same purpose.

Minnery tank has a stone mound with two sluices, through which the country, as far as about Soungervilla, is supplied with water, conducted by a canal which is that which falls into the Peereatory canal, one mile from Soungervilla. The inhabitants of this part of the country are entirely dependent, with respect to the cultivation of their fields, upon Minnery tank, and as it is only at present supplied with rain water, they frequently suffer (from droughts) a failure, more or less, in a crop. They obtain but one a year; formerly when the tanks were constantly supplied with water from the Ambanganga, the country was cultivated at pleasure.

Kowdella tank is six miles to the northward of Minnery tank, and is the largest in this part of the country, being as extensive as Minnery and Kandelly tanks together. The high road passes over the mound of this tank, which is built alternately of stone and sand. It has three sluices through the mound, along which the water formerly flowed, and joined the stream from the Minnery sluices. Minnery and Kandellah tanks are united by a canal clear of their mounds, so that when the Ambanganga water filled Minnery tank, it ran to Kowdellah, and so passed on to Kandelly

tank, filling three intermediate tanks, viz., those of Pooleankade-watta, Addikore, and Permamadua.

Kandelly tank is small compared with what it originally was. The inside of the principal mound is about a mile and a half long. The stones are simply laid in layers, one over the other, giving it the appearance of a flight of steps in a line perfectly straight—there is not the least appearance of masonry or mechanical art in the formation of this mound (except the sluices). The stones are about the size that two men would carry, taken from the neighbouring hills, which are of themselves piles of loose stones. Kandelly tank rises during the rains from its lowest state ten or twelve feet at the mound, and issues through two sluices running to Tamblegam lake. The country about Tamblegam can be completely inundated by water from this tank, though there may not have been a shower of rain for several weeks, thus showing the great importance of such reservoirs. A canal enters Kandelly tank from Kowdellah, and the wannyar of Minnery confidently asserts, that canoes and boats formerly went between Kandelly and Ellaharah in that direction, and that it was the general opinion that these tanks were formerly kept full with water from the Ambanganga, a communication which could again be opened with little expense, as masonry would not be required.

These large tanks, numerous small ones, with ruins of fallen wharfs, remains of deserted villages, and other remnants of antiquity, prove that the vast wilderness of beautiful and valuable forest trees, through which the new line of road passes, heretofore supposed a trackless desert, obnoxious to the existence of man, and destitute of water and inhabitants, once contained a considerable population, by whose labours an extensive tract of irrigated lands was regularly cultivated.

III.—*Reports on the Navigation of the Euphrates.*—By Captain Chesney, R.A. By George Long, Esq.

WHILE new parts of the world are daily becoming better known through European enterprise, many most interesting portions of the ancient world seem likely to be forgotten or neglected, though, both for their physical character and the historical recollections attached to them, they furnish materials as ample for the inquirer into natural phenomena, and infinitely more abundant for him who studies the history of man, and the revolutions of political societies.

The object of Captain Chesney's memoir is to show the practicability of a communication with India by means of the Euphrates. With this view he has minutely examined the river between Anna